Docket No.: 9189 (A-947B)
01017/40451)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Brockhaus et al.

Application No.: 08/444,790 Art Unit: 1646

Filed: May 19, 1995 Examiner: Z. Howard

For: HUMAN TNF RECEPTOR

DECLARATION OF STEWART LYMAN, PH.D. UNDER 37 C.F.R 1.132

1. I received a Ph.D. in Oncology from the McArdle Laboratory for Cancer Research at the University of Wisconsin-Madison in 1984. I did postdoctoral research at the Fred Hutchinson Cancer Research Center in Seattle, and joined Immunex Corporation as a molecular biologist in 1988. I was a scientist at Immunex Corporation for 14 years, eventually becoming Director of Extramural Research. After Amgen acquired Immunex in 2002, I stayed on and worked for Amgen for three months in a transitional role. Since 2004, I have managed my own consulting business, and I am being compensated for my time consulting on this matter at my usual hourly rate. I also own 100 shares of Amgen stock. My Curriculum Vitae is attached as Exhibit A.

2. I have reviewed the above-identified application as originally filed. I have also reviewed the presently pending claims, attached as Exhibit B. I have been informed that the effective filing date of the above-identified application is September 10, 1990.

3. I have been informed that the Patent Office has rejected the claims as failing to comply with the written description requirement, in an Office Action dated

February 23, 2007. I have reviewed pages 8-13 of the Office Action and make this declaration to address the issues raised by the statements reproduced in Exhibit C.

4. I have been informed that the standard for satisfying the written description requirement is that one skilled in the art, upon reading the specification, would recognize that the inventors had possession of the invention that is claimed. In addition, I have been informed that "possession" does not necessarily mean that they had actually made the invention, but that they had a complete idea of the invention and provided a description of it that could be understood by one of skill in the art.

5. I believe that I am qualified by my education and training to attest to what one skilled in the art would have understood from reading the application as of September 10, 1990. In 1990, I was well experienced in the molecular biology of type I transmembrane receptors. Type I transmembrane receptors have an amino terminal extracellular region followed by a transmembrane domain and then an intracellular or cytoplasmic domain. Thus, it is the amino, rather than the carboxy, end of a type I transmembrane receptor that is exposed on the surface of a cell. For example, we had recently cloned and expressed the c-kit tyrosine kinase receptor protein, a type I transmembrane receptor (Williams et al., Cell, 63:167-174, 1990). In addition, I had worked on elucidating the relationship between the IL-4 receptor (also a type I transmembrane receptor) and other cytokine receptors. (Cosman et al., Trends in Biol. Sci. 15:265-270, 1990) The extracellular, ligand-binding domain of the IL-4 receptor showed homology to several other cytokine receptors. This homology allowed us to define a new class

of cytokine receptors. Starting in 1988, I also initiated a project at Immunex that resulted in the cloning of a number of cell surface receptors and their ligands. During the course of this work, I had occasion to make DNA constructs encoding soluble forms of type I transmembrane receptors as well as insoluble chimeric receptors containing the extracellular domain of one receptor fused to the transmembrane and cytoplasmic domains of a different receptor.

6. I note the following points as background to the discussion below. I read the application as being concerned with two tumor necrosis factor binding proteins ("TNF-BP"), one about 55kd in size and one about 75kd in size. The application's discussion of these two TNF binding proteins is consistent with what was known in the art as of September 10, 1990, i.e. that there were two membrane bound TNF receptors (TNFR) of approximately these sizes. The former is also variously referenced in the literature as TNFR I, 55 kd TNFR, or p55 TNFR. The latter is also variously referenced in the literature as TNFR II, 75 kd TNFR, or p80 TNFR.

7. Both of these receptors are type I transmembrane receptors. This is confirmed by the description in the application, which describes both of these TNF receptors as membrane-bound, meaning that they are anchored in the cell membrane. Each receptor contains an extracellular region, a transmembrane region, and an intracellular region. Figure 1 of the application displays the complete nucleotide and amino acid sequence of the 55 kd TNFR and also identifies its extracellular region (amino acids -28 to 182, corresponding to nucleotides 0 to 633), transmembrane region (amino acids 182-201) and ~~extracellular~~ intracellular region (amino acids 202-426). Figure 4 of the application displays a partial nucleotide and

7/17/07

amino acid sequence corresponding to the p75 TNFR. The membrane-bound nature of the TNF binding proteins and their potential truncation into soluble fragments is described in the application at page 7, lines 13-16, which states:

> In more detail, the proteins of the present invention are non-soluble proteins, i.e. for example membrane proteins or so-called receptors, and soluble or non-soluble fragments thereof, which bind TNF (TNF-BP) . . .

8. One of skill in the art as of September 10, 1990 would have understood that the application used the term "soluble fragment" to mean a fragment of the full length receptor missing the intracellular and transmembrane regions. See, for example, the explanation of "soluble" as meaning "non-membrane bound" at page 3, lines 14-16 of the application: ("Moreover, the TNF-binding proteins described in the state of the art are *soluble, i.e. non-membrane bound,* TNF-BP. . ."). Thus, the term "soluble fragment" refers to the extracellular domain of a TNF receptor or fragments of this domain. For most, if not all, type I receptors that I was aware of as of 1990, the extracellular domain is the ligand-binding portion of the protein. Thus, one of skill in the art would have expected that the extracellular region of TNFR would bind to TNF.

9. The application's use of the term "soluble fragment" is consistent with how the term was used in the art at the time. For example, see Deen *et al. Nature* 331(6151):82-84, 1988. Deen *et al.* showed that introducing a termination codon at the boundary between the sequence encoding the extracellular domain and the transmembrane domain would result in a soluble form of the CD4 receptor protein. This extracellular domain of CD4 was secreted from transfected cells into the cell culture, and could inhibit binding of HIV to CD4+ T cells (see Figure 3 of Deen *et al.*).

10. Anyone skilled in the art at the time would also have known that the application contemplated the ***extracellular region*** of the TNF binding protein as ***a particular, specifically described example of a soluble fragment.*** This fact is clearly conveyed by the following statements from the application:

> DNA sequences which code for *soluble protein fragments* are, for example, those which extend from nucleotide -185 to 633 or from nucleotide -14 to 633 of the sequence given in Figure 1. (page 10, line 19-23) [emphasis added]

In fact, "nucleotide -14 to 633 of the sequence given in Figure 1" is a sequence which encodes the entire extracellular domain of p55 TNFR, including the signal sequence (as well as some additional upstream nucleotide sequence).

> A DNA fragment which contained only the cDNA coding for the *extracellular part* of the 55 kD TNF-BP (amino acids -28 to 182 according to FIG. 1) was obtained by PCR technology . . . (page 37, lines 14-18) [emphasis added]
>
> Analogously to the procedure described in Example 9, the cDNA fragment coding for the *extracellular region* of the 55 kDa TNF-BP was amplified in a polymerase chain reaction, . . . (page 42, lines 5-8) [emphasis added]

11. One of skill in the art at the time would have understood the following statement in the application (at page 3, line 35 through page 4, line 3) to be describing fusions of a "soluble fragment" of a TNF binding protein (either the 55 kd or 75 kd TNF receptor) to the portions of the heavy chain of human immunoglobulin described below:

> This invention comprises DNA sequences which combine two partial DNA sequences, one sequence encoding soluble fragments of TNF binding proteins and the other partial sequence encoding all domains except the first domain of the constant region of the heavy chain of human immunoglobulin IgG, IgA, IgM, or IgE, and the recombinant proteins encoded by these sequences.

12. One of skill in the art at the time would also have known that the application contemplated the ***extracellular region*** of the TNF binding protein as ***a particular, specifically described example of a soluble fragment to be fused to a portion of an immunoglobulin***. This fact would have been clearly understood from reading the entirety of the application, especially Example 11, which describes amplifying the cDNA fragment coding for the extracellular region of the 55 kd TNFR and ligating this cDNA fragment to a pCD4-Hγ3 vector (which is described at page 17, lines 18-31 as containing DNA encoding an immunoglobulin fragment consisting of all domains except the first domain of the constant region of the heavy chain):

> . . *the cDNA fragment coding for the extracellular region* of the 55 kDa TNF-BP was amplified in a polymerase chain reaction. . . *This cDNA fragment was ligated in the pCD4-Hγ3 vector* [DSM 5523; European Patent Application No. 90107393.2; Japanese Patent Application No. 108967/90; U.S. patent application Ser. No. 510773/90] from which the CD4-cDNA had been removed via the SstI restriction cleavage sites. (page 42, lines 6-25)] [emphasis added]

13. I disagree with the Office Action's statements at pages 8 and 9 that:

> While the sequence of the entire extracellular domain of the 75kD TNF receptor was publicly available in the references of Smith (1990) and Dembic (1990) at the time of filing of the instant application, there is no description in the instant specification of these specific full-length sequences, or any description that suggests using these full-length sequences in the claimed fusion proteins. [pages 8-9 of Office Action]

While I would agree that the full length amino acid sequence disclosed in Smith (1990) or Dembic (1990) is not reproduced amino acid by amino acid, there is a description in the application of using fragments of such full length sequences in fusion proteins.

> On the basis of the thus-determined sequences *and of the already known sequences for certain receptors*, those partial sequences which code for soluble TNF-BP fragments can be determined and cut out from the complete sequence using known methods [42]. [emphasis added]

Specification, page 14, lines 32-36. This language, coupled with the citation of the Smith reference within the specification, shows that the inventors were aware of the published sequence of p75 TNFR and intended to use TNF-binding fragments of such known sequences in practicing their invention.

14. I strongly disagree with the following statement at page 10 of the Office Action:

> Applicants' disclosure at the time of filing would not have lead the skilled artisan to the particular species of fusion protein comprising the entire extracellular domain found in Smith. [page 10 of Office Action]

Using the entire extracellular domain of a known and referenced type I transmembrane receptor protein is exactly what the disclosure would lead the skilled artisan to do.

15. There is a description in the application of the specific full length sequence of the 75 kD TNFR. The citation to the Smith (1990) article at page 10, lines 9-10 of the application indicates that the Applicants knew of the Smith (1990) article when they drafted the application.

16. As of September 10, 1990 one of skill in the art would look to publications, such as the Smith (1990) article, to complete the sequences of partial cDNAs. In fact, I cannot imagine anyone of skill in the art ignoring publicly available sequence, and refusing to take advantage of it to complete a partial cDNA sequence. It is disclosed in the application (page 35, lines 22-33) that Figure 4 is a partial cDNA sequence. Since the amino acid sequence of Figure 4 is almost identical (almost 99% identical) to that of Smith, it would be clear to one of skill in the art that the

protein represented by the Figure 4 sequence was the same protein described in Smith. Attached as Exhibit D is an alignment of the Figure 4 sequence with the complete sequence of p75 TNFR to illustrate this point. Further, the disclosure (page 33, lines 7-19) of the following 18-mer as the amino terminal peptide of p75 was also consistent with this conclusion:

Leu-Pro-Ala-Gln-Val-Ala-Phe-X-Pro-Tyr-Ala-Pro-Glu-Pro-Gly-Ser-Thr-Cys.

17. For the reasons stated above in paragraphs 6-16, there is a description in the application of using the entire extracellular region of a TNFR, including the 75 kd TNFR, in the claimed fusion proteins. Although the working examples exemplify a fusion protein comprising the entire extracellular region of the 55 kd TNFR, it is readily apparent that the application's description applies equally to the 75 kd TNFR. As the application states:

> Since the invention has been described hereinbefore in general terms, the following Examples are intended to illustrate details of the invention, but they are not intended to limit its scope in any manner.

Specification, page 20, lines 27-30. Put another way, it would be unreasonable to conclude that this description of soluble fragments of TNF binding proteins applied only to the 55 kd TNFR and not the 75 kd TNFR. Thus, the application clearly contemplated that one example of a fusion protein contained the entire extracellular region of the 75 kd TNFR and a portion of an immunoglobulin.

18. Upon reading the application as of September 10, 1990, one of skill in the art would not have arrived at the same factual conclusion that the Office Action reached at page 9 regarding the reference to Smith.

> The phrase "such a deletion" must refer to the "deletions" recited in the previous sentence, which are deletions made to the nucleotide sequence of Figure 1 or Figure 4. Therefore, this paragraph refers solely to nucleotide

> sequences with deletions of one or more nucleotides to the sequences given in Figure 1 or Figure 4, and the proteins encoded by said nucleotides.

The stated interpretation of the reference to Smith, i.e. that Smith must disclose a fragment of the amino acid sequence of Figure 4, is illogical for the following reasons.

19. First, the application informs the reader at page 10, lines 23-26 that the sequence of Figure 4 is a partial sequence, not a complete sequence (as the Office Action points out, Figure 4 is missing a portion of the N-terminal sequence). There is no soluble fragment sequence disclosed in Smith (1990) which would be a fragment of Figure 4. Thus, the reference to Smith (1990) cannot be referring solely to a sequence that is a deletion of Figure 4 because, if anything, Smith (1990) is more complete. Clearly, then, Smith (1990) must have been referenced for another reason.

20. Second, the Office Action takes the sentences citing Smith (1990) out of the context of the entire paragraph. When the entirety of the paragraph is read, one sees that the paragraph begins with a statement indicating that this paragraph is describing soluble and non-soluble fragments of TNF binding proteins. Thus, one of skill in the art would have concluded that the citation to Smith (1990) was a reference to whatever soluble or non-soluble fragments of TNF binding proteins were described in the article. The relevant paragraph is reproduced in its entirety below:

> In addition thereto, the present invention is also concerned with DNA sequences coding for proteins and soluble or non-soluble fragments thereof, which bind TNF. Thereunder there are to be understood, for example, DNA sequences coding for non-soluble proteins or soluble as well as non-soluble fragments thereof, which bind TNF, such DNA sequences being selected from the following

> (a) DNA sequences as given FIG. 1 or FIG. 4 as well as their complementary strands, or those which include these sequences;
>
> (b) DNA sequences which hybridize with sequences defined under (a) or fragments thereof ;
>
> (c) DNA sequences which, because of the degeneracy of the genetic code, do not hybridize with sequences as defined under (a) and (b), but which code for polypeptides having exactly the same amino acid sequence.
>
> That is to say, the present invention embraces not only allelic variants, but also those DNA sequences which result from deletions, substitutions and additions from one or more nucleotides of the sequences given in FIG. 1 or FIG. 4, whereby in the case of the proteins coded thereby there come into consideration, just as before, TNF-BP. One sequence which results from such a deletion is described, for example, in Science 248, 1019-1023, (1990).

Specification, page 9, line 19 through page 10, line 10. Despite differences between the sequences disclosed in the application and those in the Smith (1990) article, I would interpret this paragraph to mean that the Smith sequence was contemplated by the inventors because the Smith (1990) article is specifically cited.

21. Third, one skilled in the art would have read the entire application, not just the quoted paragraph, in light of the disclosure of the cited Smith (1990) article. Thus, such a skilled person would have read all of the application's description relating to soluble and insoluble fragments of TNF binding proteins in light of the Smith (1990) article's disclosure of the entire extracellular region, the transmembrane region, and the intracellular region of the 75 kd TNFR, as well as its disclosure of an N-terminal cysteine-rich region of amino acids 1-162 that is a fragment of the extracellular region (see page 1020; lower right column to

JDA 7/17/07

page 1021; upper left column and Figure 3 at page 1021). In 1990, it was common practice to use what is published to aid in assembling a full length sequence.

22. For these reasons above, I disagree with the statement at page 9 of the Office action that:

> Therefore, the reference to Smith in the specification does not refer to a nucleotide sequence encoding the full-length extracellular domain of the receptor disclosed in Smith.

23. Moreover, one of skill in the art would not have read the application by itself without reference to any other known information. Instead, such a person would have read the application in view of what was known in the art at the effective filing date. One of skill in the art would have noted that Dembic *et al., Cytokine* 2(4):231-7, 1990, published by some of the same authors as the inventors on the application, disclosed the entire sequence of the mature 75 kd TNFR, which was the same sequence as in Smith (1990), and the same extracellular region (page 232 to page 233, upper left column; and Figure 1 at page 232). The skilled person would have looked to this publication for its disclosure of the entire extracellular region of the 75 kd TNFR, for the reasons discussed above that the application references such extracellular region as a specific type of contemplated soluble fragment. Thus, one of skill in the art would have had no doubt that the inventors were in possession of the entire p75 sequence as of September 10, 1990.

24. Thus, for all of the reasons discussed above, one skilled in the art at the time would have understood that the application contemplated that the entire extracellular region of p75 TNFR was a specific example of a soluble fragment of a TNF binding protein. This skilled person, in reading the portions of the application addressing fusion proteins containing a soluble fragment of TNF

binding protein, would have looked to the publications at the time, including the Smith (1990) article cited in the application and the Dembic (1990) article published by the inventors, for their disclosure of the sequence of the extracellular region of p75 TNFR. One of skill in the art would moreover have looked to the publications at the time for whatever they disclosed with respect to soluble and insoluble fragments of p75 TNFR. If the sequence is available, of course one of skill at the time would have used such a sequence to construct a clone. This is especially the case here, where it is indicated in the specification that the Smith (1990) article is a source of information about soluble fragments of the TNF-BP that can be used, and it would be a straightforward matter to apply what is already available in the art.

25. I further declare that all statements made herein of my own knowledge are true, that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both (18 U.S.C. § 1001), and may jeopardize the validity of the application or any patent issuing thereon.

Dated: May 22, 2007 Stewart David Lyman

Stewart David Lyman

EXHIBIT A

CURRICULUM VITAE

NAME: Stewart David Lyman

PRESENT POSITION: Manager, Lyman BioPharma Consulting LLC

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PLACE OF BIRTH: New Rochelle, NY

EDUCATION:

Degree	Institution	Discipline
B.S. (Magna cum laude)	State University of New York at Albany, Albany, NY	Biology
Ph.D.	McArdle Laboratory for Cancer Research University of Wisconsin Madison, WI	Oncology
Dissertation:	"Genetic and Metabolic Factors that May Affect the Biological Activity of Xenobiotics in Mice"	

EMPLOYMENT HISTORY:
2004 – present: Manager, Lyman BioPharma Consulting LLC

2002: Amgen Inc.

1988-2002: Immunex Corporation:
- 1999-2002: Director, Extramural Research
- 1993-1999: Senior Staff Scientist
- 1988-1992: Staff Scientist
  - Project Chair, creator of the Receptors in Search of Ligands (RISOL) Project, 1989-1994. Receptors used as tools to clone novel ligands.
  - Project Chair of the Signal Transduction Project, 1990-1991.
  - Project Chair of the Flt3 Ligand Development Project, 1994-1996.
  - Project Co-Chair of the Expressed Sequence Tag Project, 1995-1996.
  - Project Co-Chair of the Core Pipeline Technology Project, 1997-1999.
  - Project Co-Chair of the Basic Biology Project, 1999.

1984-1988: Post-doctoral Fellow: Fred Hutchinson Cancer Research Center, Seattle, WA. Laboratory of Dr. Larry Rohrschneider. Studied the mechanism of cellular transformation by the v-*fms* oncogene.

PROFESSIONAL ASSOCIATIONS:

American Association for the Advancement of Science

RESEARCH INTERESTS:

Identification of novel growth factors; role of growth factors in development of the hematopoietic and immune systems, role of growth factors in oncology.

HONORS AND AWARDS:

Regents Scholarship, SUNY Albany, 1973-1977
Biological Honor Society, SUNY Albany, 1976-1977
Danforth Fellowship nominee, SUNY Albany, 1977
U.S. Public Health Service National Research Service Award
McArdle Laboratory for Cancer Research, 1977-1982
NIH Postdoctoral Training Grant in Viral Oncology
University of Washington, January-September 1985
Individual National Research Service Award,
National Cancer Institute, October 1985-December, 1987.
Visiting Scientist Fellowship, Molecular Biology Computer Research
Resource, Dana-Farber Cancer Institute, Boston, MA; December 1986

ADVISORY BOARDS:

Advisory Board Member "Modern Drug Discovery", 1998 - 2004.

AWARDED PATENTS AND PATENT APPLICATION FILINGS:

U.S. Patent #5,512,457 – Cytokine designated Elk ligand
U.S. Patent #5,627,267 – Cytokine designated Elk ligand
U.S. Patent #5,670,625 – Elk ligand fusion proteins
U.S. Patent #5,728,813 – Antibodies directed against Elk ligand
U.S. Patent #5,554,512 – Ligands for Flt3 receptors
U.S. Patent #5,843,423 – Flt3 ligand stimulation of hematopoietic cells
U.S. Patent #6,190,655 – Flt3 ligand uses for exogenous gene transfer
U.S. Patent #6,540,992 – Methods for using elk-L to enhance neuronal survival
U.S. Patent #6,555,520 – Human TSLP DNA and polypeptides
U.S. Patent #6,630,143 – Antibodies against flt3 ligand
U.S. Patent #6,632,424 – Human flt3 ligand
U.S. Patent #6,762,030 – Ligand for CD7, and methods for use thereof
U.S. Patent #6,919,206 – Medium containing flt3 ligand for culturing hematopoietic cells
U.S. Patent #6,994,989 – FLK-1 binding proteins
U.S. Patent #7,041,282 – Ligands for flt3 receptors
U.S. Patent #7,045,128 – Antibodies against flt3 ligand

WO 92/00376 – The c-*kit* ligand (Steel factor)
WO 97/17442 – Novel VEGF related ligand for flk-1/KDR receptor
WO 99/33984 – V197 Polypeptide

WO 99/33983 – V201 Polypeptide
WO 99/33877 – V196 Polypeptide

INVITED TALKS AT MEETINGS:

Biology of IL-4 Receptor:
FASEB conference on Receptors, June 1990
Biotechnological Applications in the 1990's, UC-Irvine, Irvine, CA, May 1990

Biology of Steel Factor (c-*kit* Ligand):
Armand Hammer Workshop: Regulation of Hematopoietic Stem Cells, La Jolla, CA, October 1990

Nargis Dutt Memorial Symposium: Cytokines in Clinical Medicine, UC-Irvine, Irvine CA October 1990

Stromal Regulation of Hematopoiesis, Bethesda, MD, June 1991
Blood Cell Growth Factors Meeting, Beijing, China, August 1991
American Society for Pediatric Hematology/Oncology, Chicago IL, September 1991
AACR 43rd Annual Symposium on Fundamental Cancer Research: "Growth Factors and their Receptors in Cancer: Basic Mechanisms and Therapy" Houston, Texas, November 1991

Biology of Flt3 Ligand:
Plenary Session, 1993 ASH meeting, St. Louis, MO. December, 1993
Keystone Hematopoiesis Conference, Breckenridge, CO January, 1994
Advances in Bone Marrow Transplantation, Valhalla, NY March 7, 1994
Advances in Hematopoiesis Conference, Tokyo, Japan July 1994
The Metcalf Forum: Polyfunctionality of Hematopoietic Regulators, Dublin, Ireland September 1994

Mehdi Tavissoli Memorial Symposium: Hematopoietic Stem Cells, Reno, Nevada, November 1994
Taniguchi Foundation Symposium: Regulation of Hematopoietic Stem Cells, Osaka, Japan, December 1994
9th Symposium, Molecular Biology of Hematopoiesis, Genoa, Italy, June 24-27, 1995
International Society for Experimental Hematology, Dusseldorf, Germany, August 26-31, 1995
International Symposium on Bone Marrow Transplantation: Basic and Clinical Studies, Tokyo, Japan, October 9-10, 1995
American Association for Cancer Research Satellite Symposium: Cytokines and Cytokine Receptors, Lake George, NY, October 1995
Southern Blood Club, New Orleans, LA, February 1, 1996
Wilsede Conference, Human Leukemia Meeting, Hamburg, Germany, June 14-18, 1996
Research Trends in Hematopoietic Cell Culture, Tokyo, Japan, August 26-28, 1996
Biological Therapy of Cancer, Munich, Germany, June 11-14, 1997
IBC conference "Hematopoietic Stem Cells" San Diego, CA, June 23-24, 1997
International Society for Experimental Hematology, Cannes, France, August 24-28, 1997
Mini-symposium: Tyrosine kinase receptors, University of Lund, Sweden, August 29, 1997

PUBLICATIONS (Abstracts not included):

1. **Lyman, S.D.**, Poland, A., and Taylor, B.A. Genetic polymorphism of microsomal epoxide hydrolase activity in the mouse. J. Biol. Chem. 255, 8650-8654, 1980.

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3. Jordan, V.C., Bain, R.R., **Lyman, S.D.**, and Brown, R.R. Analysis of Tamoxifen and its metabolites. In: Drug Determination in Therapeutic and Forensic Context, Ed. by E. Reid and I.D. Wilson, Plenum Press, p. 219-225, 1984.

4. **Lyman, S.D.**, and Jordan, V.C. Antiestrogenic effect of trifluoperazine in mice. Biochem. Pharmacol. 34, 2221-2224, 1985.

5. **Lyman, S.D.**, and Jordan, V.C. Metabolism of Tamoxifen and its uterotrophic activity. Biochem. Pharmacol. 34, 2787-2794, 1985.

6. **Lyman, S.D.**, and Jordan, V.C. Possible mechanisms for the agonist actions of Tamoxifen and the antagonist actions of MER-25 (Ethamoxytriphetol) in the mouse uterus. Biochem. Pharmacol. 34, 2795-2806, 1985.

7. Jordan, V.C., Tate, A.C., **Lyman, S.D.**, Gosden, B., Wolf, M.F., Bain, R.R., and Welshons, W.V. Rat uterine growth and induction of progesterone receptor without estrogen receptor translocation. Endocrinology 116, 1845-1857, 1985.

8. **Lyman, S.D.**, and Jordan, V.C. Metabolism of non-steroidal antiestrogens, In: Estrogen and Antiestrogen Action (V.C. Jordan, Ed.), University of Wisconsin Press, Madison, WI, pp. 191-219, 1986.

9. **Lyman, S.D.**, and Rohrschneider, L.R. Analysis of functional domains of the v-*fms* encoded protein of feline sarcoma virus by linker insertion mutagenesis. Molecular and Cellular Biology 7, 3287-3296, 1987.

10. **Lyman,S.D.**, Park,L. and Rohrschneider, L.R. Colony stimulating factor-1 induced growth stimulation of v-*fms* transformed fibroblasts. Oncogene 3, 391-395,1988.

11. **Lyman, S.D.** and Rohrschneider, L.R. The kinase activity of the v-*fms* encoded protein has a low pH optimum. Oncogene Research 4, 149-155, 1989.

12. Idzerda, R.L., March, C.J., Mosley, B., **Lyman, S.D.**, VandenBos, T., Gimpel, S.D., Din, W.S., Grabstein, K.H., Widmer, M.B., Park, L.S., Cosman, D., and Beckmann, M.P. Human interleukin-4 receptor confers biological responsiveness and defines a novel receptor superfamily. J. Exp. Med. 171, 861-873, 1990.

13. Beckmann, P.M., Cosman, D., Mosley, B.,Maliszewski, C.R., **Lyman, S.D.**, March, C.J., Park, L.S., and Idzerda, R.L. Characterization of the interleukin-4 receptor: A member of the hematopoietin receptor superfamily, in Molecular and Cellular Biology of Cytokines Oppenheim, Powanda, Kluger, and Dinarello, Eds. Wiley-Liss, Inc. pp. 161-166, 1990.

14. Cosman, D., **Lyman, S.D.**, Idzerda, R.L., Beckmann, M.P., Park, L.S., Goodwin, R.G., and March, C.J. A new cytokine receptor superfamily. Trends in Biol. Sci. 15: 265-270, 1990.

15. Williams, D. E., Eisenman, J. , Baird, A. , Rauch, C. , Van Ness, K., March, C.J., Park, L.S., Martin, U., Mochizuki, D.Y., Boswell, H. S., Burgess, G. S., Cosman, D., and **Lyman, S.D.** Identification of a ligand for the c-*kit* proto-oncogene. Cell, 63, 167-174, 1990.

16. Copeland, N.G., Gilbert, D.J., Cho, B.C., Donovan, P.J., Jenkins, N.A., Cosman, D., Anderson, D., **Lyman, S.D.**, and Williams, D.E. Mast cell growth factor maps near the steel locus on mouse chromosome 10 and is deleted in a number of steel alleles. Cell 63, 175-183, 1990.

17. Anderson, D. M., **Lyman, S. D.**, Baird, A., Wignall, J.M., Eisenman, J., Rauch, C., March, C.J., Boswell, H. S., Gimpel, S.D., Cosman, D., and Williams, D. E. Molecular cloning of mast cell growth factor, a hematopoietin that is active in both membrane bound and soluble forms. Cell 63, 235-243, 1990.

18. Broxmeyer, H.E., Cooper, S., Lu, L., Hangoc, G., Anderson, D., Cosman, D. **Lyman, S.D.**, and Williams, D.E. Effect of murine mast cell growth factor (c-*kit* proto-oncogene ligand) on colony formation by human marrow hematopoietic progenitor cells. Blood 77, 2142-2149, 1991.

19. Broxmeyer, H.E., Hangoc, G., Cooper, S., Anderson, D., Cosman, D., **Lyman, S.D.**, and Williams, D.E. Influence of murine mast cell growth factor (c-*kit* ligand) on colony formation by mouse marrow hematopoietic progenitor cells. Exp. Hematol. 19, 143-146, 1991.

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EXHIBIT B

PENDING CLAIMS

Claims 1-61 (canceled)

62. (previously presented) A protein comprising

(a) a human tumor necrosis factor (TNF)-binding soluble fragment of an insoluble human TNF receptor, wherein the insoluble human TNF receptor (i) specifically binds human TNF, (ii) has an apparent molecular weight of about 75 kilodaltons on a non-reducing SDS-polyacrylamide gel, and (iii) comprises the amino acid sequence LPAQVAFXPYAPEPGSTC (SEQ ID NO: 10); and

(b) all of the domains of the constant region of a human immunoglobulin IgG heavy chain other than the first domain of said constant region;

wherein said protein specifically binds human TNF.

Claims 63-101 (canceled)

102. (previously presented) The protein of claim 62, wherein the soluble fragment comprises the peptides LCAP (SEQ ID NO: 12) and VFCT (SEQ ID NO: 8).

103. (previously presented) The protein of claim 102, wherein the soluble fragment further comprises the peptide LPAQVAFXPYAPEPGSTC (SEQ ID NO: 10).

Claim 104 (canceled)

105. (previously presented) The protein of claim 62, wherein said human immunoglobulin IgG heavy chain is IgG_1.

106. (previously presented) A protein comprising

(a) a human tumor necrosis factor (TNF)-binding soluble fragment of an insoluble human TNF receptor, wherein the insoluble human TNF receptor (i) specifically binds human TNF, (ii) has an apparent molecular weight of about 75 kilodaltons on a non-reducing SDS-

polyacrylamide gel, and (iii) comprises the amino acid sequences LPAQVAFXPYAPEPGSTC (SEQ ID NO: 10), LCAP (SEQ ID NO: 12), VFCT (SEQ ID NO: 8), NQPQAPGVEASGAGEA (SEQ ID NO: 9) and VPHLPAD (SEQ ID NO: 13),

wherein the soluble fragment comprises the peptides LCAP (SEQ ID NO: 12) and VFCT (SEQ ID NO: 8); and

(b) all of the domains of the constant region of a human IgG_1 heavy chain other than the first domain of the constant region;

wherein said protein specifically binds human TNF.

107. (previously presented) A recombinant protein encoded by a polynucleotide which comprises two nucleic acid subsequences,

(a) one of said subsequences encoding a human TNF-binding soluble fragment of an insoluble human TNF receptor protein having an apparent molecular weight of about 75 kilodaltons on a non-reducing SDS-polyacrylamide gel, said soluble fragment comprising ~~a~~ the amino acid sequence LPAQVAFXPYAPEPGSTC (SEQ ID NO: 10), and

(b) the other of said subsequences encoding all of the domains of the constant region of the heavy chain of a human IgG immunoglobulin other than the first domain of said constant region,

wherein said recombinant protein specifically binds human TNF.

Claims 108 and 109 (canceled)

110. (previously presented) The protein of claim 107, wherein the soluble fragment comprises the peptides LCAP (SEQ ID NO: 12) and VFCT (SEQ ID NO: 8).

111. (previously presented) The protein of claim 110, wherein the soluble fragment further comprises the peptide LPAQVAFXPYAPEPGSTC (SEQ ID NO: 10).

Claim 112 (canceled)

113. (previously presented) The protein of any one of claims 107, 110 or 111, wherein said human immunoglobulin heavy chain is IgG_1.

114. (previously presented) A pharmaceutical composition comprising the recombinant protein of any of claims 62, 107, 134 or 135 and a pharmaceutically acceptable carrier material.

Claims 115-118 (canceled)

119. (previously presented) The protein of claim 62, wherein the protein is purified.

120. (previously presented) The protein of claim 62, wherein the protein is produced by CHO cells.

121. (previously presented) The protein of claim 62, wherein the protein consists of (a) the soluble fragment of the receptor and (b) all of the domains of the constant region of the human immunoglobulin IgG heavy chain other than the first domain of the constant region.

Claim 122 (canceled)

123. (previously presented) The protein of claim 62, wherein said domains of the constant region of the human immunoglobulin heavy chain consist essentially of the immunoglobulin amino acid sequence encoded by pCD4Hγ1 vector (deposited at Deutschen Sammlung von Mikroorganismen und Zellkulturen GmbH (DSM) in Braunschweig, FRG under No. DSM 5314) or by pCD4-Hγ3 vector (deposited at Deutschen Sammlung von Mikroorganismen und Zellkulturen GmbH (DSM) in Braunschweig, FRG under No. DSM 5523).

124. (previously presented) The protein of claim 105, wherein said domains of the constant region of the human immunoglobulin heavy chain consist essentially of the immunoglobulin amino acid sequence encoded by pCD4Hγ1 vector (deposited at Deutschen

Sammlung von Mikroorganismen und Zellkulturen GmbH (DSM) in Braunschweig, FRG under No. DSM 5314).

125. (previously presented) The protein of claim 106, wherein the protein is purified.

126. (previously presented) The protein of claim 106, wherein the protein is produced by CHO cells.

127. (previously presented) The protein of claim 106, wherein the protein consists of (a) the soluble fragment of the receptor and (b) all of the domains of the constant region of the human IgG_1 heavy chain other than the first domain of the constant region.

128. (previously presented) The protein of claim 106, wherein the soluble fragment further comprises the peptide LPAQVAFXPYAPEPGSTC (SEQ ID NO: 10).

129. (previously presented) The recombinant protein of claim 107, wherein the recombinant protein is purified.

130. (previously presented) The recombinant protein of claim 107, wherein the recombinant protein is produced by CHO cells.

131. (previously presented) The recombinant protein of claim 107, wherein the protein consists of (a) the soluble fragment of the receptor and (b) all of the domains of the constant region of the human IgG_1 heavy chain other than the first domain of the constant region.

132. (previously presented) The protein of claim 107, wherein said domains of the constant region of the human immunoglobulin heavy chain consist essentially of the immunoglobulin amino acid sequence encoded by pCD4Hγ1 vector (deposited at Deutschen Sammlung von Mikroorganismen und Zellkulturen GmbH (DSM) in Braunschweig, FRG under No. DSM 5314) or by pCD4-Hγ3 vector (deposited at Deutschen Sammlung von Mikroorganismen und Zellkulturen GmbH (DSM) in Braunschweig, FRG under No. DSM 5523).

133. (previously presented) The protein of claim 113, wherein said domains of the constant region of the human immunoglobulin heavy chain consist essentially of the immunoglobulin amino acid sequence encoded by the DNA insert of pCD4Hγ1 vector (deposited at Deutschen Sammlung von Mikroorganismen und Zellkulturen GmbH (DSM) in Braunschweig, FRG under No. DSM 5314).

134. (previously presented) A protein consisting of

(a) a human tumor necrosis factor (TNF)-binding soluble fragment of an insoluble human TNF receptor, wherein the insoluble human TNF receptor (i) specifically binds human TNF, and (ii) has an apparent molecular weight of about 75 kilodaltons on a non-reducing SDS-polyacrylamide gel and (iii) comprises the amino acid sequence LPAQVAFXPYAPEPGSTC (SEQ ID NO: 10),

wherein the soluble fragment comprises the peptides LCAP (SEQ ID NO:12) and VFCT (SEQ ID NO:8), and

(b) all of the domains of the constant region of a human IgG_1 heavy chain other than the first domain of the constant region,

wherein the protein specifically binds human TNF, and

wherein the protein is produced by CHO cells.

135. (previously presented) The protein of claim 134, wherein the soluble fragment comprises the peptide LPAQVAFXPYAPEPGSTC (SEQ ID NO: 10).

136. (previously presented) The protein of claim 134, wherein the protein is purified.

137. (previously presented) A pharmaceutical composition comprising the recombinant protein of claim 105 and a pharmaceutically acceptable carrier material.

Claim 138 (canceled)

139. (previously presented)A method of binding human TNF *in vivo* comprising the step of administering to a subject the pharmaceutical composition of claim 137.

140. (currently amended) A protein comprising

(a) a human tumor necrosis factor (TNF) binding soluble fragment of the amino acid sequence encoded by the cDNA insert of the plasmid deposited with the ATCC on October 17, 2006 under accession number PTA 7942; and

(b) all of the domains of the constant region of a human immunoglobulin IgG heavy chain other than the first domain of said constant region;

wherein said protein specifically binds human TNF.

141. (previously presented) The protein of claim 140 consisting of the soluble fragment and all the domains of the constant region of the human immunoglobulin IgG heavy chain other than the first domain of said constant region.

142. (previously presented) The protein of claim 140

wherein the protein is expressed by a mammalian host cell.

143. (previously presented) The protein of claim 142, wherein the mammalian host cell is a CHO cell.

144. (previously presented) The protein of claim 142 consisting of the soluble fragment and all the domains of the constant region of the human immunoglobulin IgG heavy chain other than the first domain of said constant region.

EXHIBIT C

At pages 8-9, the Office Action states:

> The specification does not provide evidence that Applicants were in possession of any TNF-binding soluble fragments of an insoluble 75kD TNF-binding receptor comprising SEQ ID NO: 10. While the sequence of the entire extracellular domain of the 75kD TNF receptor was publicly available in the references of Smith (1990) and Dembic (1990) at the time of filing of the instant application, there is no description in the instant specification of these specific full-length sequences, or any description that suggests using these full-length sequences in the claimed fusion proteins. While the specification cites Smith (1990) on page 10, the specification does not contemplate use of the sequence of the full-length extracellular domain of the receptor taught in Smith.

At page 9, the Office Action states:

> The only paragraph in the specification that refers to Smith (1990) states:
>
> 'That is to say, the present invention, embraces not only allelic variants, but also those DNA sequences which result from deletions, substitutions and additions from one or more nucleotides of the sequences given in Figure 1 or Figure 4, whereby in the case of the proteins coded thereby there come into consideration, just as before, TNF-BP. One sequence which results from such a deletion is described, for example in Science 248, 1019-1023, (1990)' (pg 10, lines 1-10)
>
> The last sentence of this paragraph is the only sentence that refers to Smith, and this sentence only refers to 'one sequence' in Smith that results from a 'such a deletion'. The phrase 'such a deletion' must refer to the 'deletions' recited in the previous sentence, which are deletions made to the nucleotide sequence of Figure 1 or Figure 4. Therefore, this paragraph refers solely to nucleotide sequences with deletions of one or more nucleotides to the sequences given in Figure 1 or Figure 4, and the proteins encoded by said nucleotides. Figure 4 shows a partial cDNA sequence of the 75 kD TNF receptor having less than the full-extracellular domain; therefore any deletions made to this sequence would not achieve a nucleotide sequence encoding the full-length extracellular domain presented in Smith. Therefore, the reference to Smith in the specification does not refer to a nucleotide sequence encoding the full-length extracellular domain of the receptor disclosed in Smith.

At page 10, the Office Action states:

> Applicants' disclosure at the time of filing would not have lead the skilled artisan to the particular species of fusion protein comprising the entire extracellular domain found in Smith. In absence of a description of the full-length extracellular domain of the 75 kD receptor for use in Applicants' claimed invention, Applicants did not have possession of the claimed invention at the time of filing.

At page 10, the Office Action states:

> The instant specification as filed contains no reference to the teachings of Dembic, and therefore there is no teaching in the instant specification indicating that the sequences disclosed in Dembic are relevant to the proteins of the instant invention, including the claimed fusion proteins. . . . Applicants' disclosure at the time of filing would not have lead the skilled artisan to the particular species of fusion protein comprising the entire extracellular domain found in Dembic.

EXHIBIT D

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p75(smith)
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p75(EP939121)
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     Length Weight:      2   Average Mismatch: -2.248
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